

REMARKS

In this Amendment, Applicants amend the Abstract, amend claims 18, 22, and 23 in order to correct informalities and to more appropriately define the present invention, and add new claims 26 – 37 to protect additional aspects of the present invention. In accordance with the requirements of 37 C.F.R. § 1.121(c)(1), Applicants provide a marked-up version of the amended claims in an attached Appendix designated “Version of Claims with Markings to Show Changes Made.” Upon entry of this Amendment, claims 1 – 37 remain pending, with claims 1 – 17 withdrawn from consideration as drawn to a nonelected invention.

In the Office Action, the Examiner objected to the Abstract as not directed to the elected invention; objected to claim 22 over informalities; and rejected claims 18 – 25 under 35 U.S.C. § 103(a) as unpatentable over Wojtczak, et al. (U.S. Patent No. 6,409,781) in view of Towery, et al. (U.S. Patent No. 6,464,740).

Procedural Issues:

Applicants mention the following procedural issues to ensure that a complete response is made to the Office Action and to clarify the written record.

The Examiner’s citation of column 14, lines 15 – 21 of the Towery reference, on page 4 of the Office Action, explicitly refers to the text of another patent, namely Kubo, et al. (U.S. Patent No. 5,527,370). The Examiner did not cite Kubo on a Notice of References Cited (PTO-892). In order to formulate a complete response to the Office Action, to uphold the duty of good faith and candor with the Office, and to uphold the duty of disclosure, Applicants therefore address Kubo in this Amendment. Since the Examiner indirectly cited the Kubo reference by applying Towery against the present application, Applicants ask the Examiner to include Kubo on a Notice of References Cited (PTO-892) in the next communication from the Office.

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Applicants should not have to cite Kubo in an IDS, since the reference was brought into the record by the Examiner. Therefore, to ensure the written record is complete, Applicants ask the Examiner to cite Kubo in the next communication from the Office, so that any patent that may issue from the present application will contain on its face a complete list of references cited. Applicants thank the Examiner in advance for cooperating in this matter.

Objection to the Abstract:

The Examiner objected to Applicants' Abstract because "the content is not directed to elected claims 18 – 25, which are method claims" (Office Action, p. 2). Applicants have amended the Abstract to comply with the Examiner's required corrections, and accordingly deem this objection overcome.

Applicants point out for the record that "[t]he abstract will not be used for interpreting the scope of the claims." *See* 37 C.F.R. § 1.72(b). Applicants attach herewith a Substitute Abstract in clean form, along with an Appendix designated "Version of Abstract with Markings to Show Changes Made," that includes a marked-up version of the Substitute Abstract detailing the changes made. No new matter has been introduced, in accordance with the requirements of 37 C.F.R. § 1.121(f).

Objection to Claim 22:

The Examiner objected to Applicants' claim 22, "because of the following informalities: at lines 11-12, "a wiring material film and laminated on" should be -- a wiring material film laminated on --" (Office Action, p. 2). Applicants have amended claim 22, one of the amendments being made to correct the informalities, and accordingly deem this objection overcome.

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Rejection of Claims 18 – 25 under 35 U.S.C. § 103(a):

Applicants respectfully traverse the rejection of claims 18 – 25, as detailed above, for the following reasons. Applicants respectfully disagree with the Examiner's arguments and conclusions, and submit that a *prima facie* case of obviousness has not been established.

In order to establish a *prima facie* case of obviousness, three basic criteria must be met. First, the prior art reference (or references when combined) must teach or suggest all the claim elements. Second, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify a reference or to combine reference teachings. Third, there must be a reasonable expectation of success. See M.P.E.P. § 2143, 8th Ed., Aug. 2001, pp. 2100-122 – 127.

The Examiner does not show that all the elements of Applicants' claims are met in the cited references, taken alone or in combination, does not show that there is any suggestion or motivation to modify the cited references to result in the claimed invention, and does not show there would be any reasonable expectation of success from so doing.

Applicants' claims 18 and 23 recite a combination of elements, including, *inter alia*,

“a chemical mechanical polishing by making use of a slurry for chemical mechanical polishing, which contains polishing particles comprising first colloidal silica particles whose primary particles have a diameter ranging from 5 to 20 nm, and second colloidal silica particles whose primary particles have a diameter larger than 20 nm, wherein the weight ratio of the first colloidal silica particles is in the range of 0.6 to 0.9 based on a total weight of said first and second colloidal silica particles.”

Wojtczak and/or Towery do not teach or suggest at least these recitations of Applicants' independent claims 18 and 23. In contrast, Wojtczak utilizes *two* slurries applied in succession,

not Applicants' claimed "a slurry" "comprising first colloidal silica particles whose primary particles have a diameter ranging from 5 to 20 nm, and second colloidal silica particles whose primary particles have a diameter larger than 20 nm." See Wojtczak, Abstract, col. 2, ll. 28 – 35 ("two-step slurry approach"), col. 2, ll. 60 – 62 ("a first slurry ... and a second slurry"), col. 3, ll. 60 – 64 ("The first slurry" and "The second slurry"), col. 4, ll. 24 – 30 ("providing a first [CMP] slurry that has a high removal rate on copper 14 and a low removal rate on barrier metal 13" and "providing a second [CMP] slurry that has a high removal rate on barrier metal 13 ... and a low removal rate on the dielectric material", and col. 9, ll. 55 – 65 (Wojtczak's claim 1).

While the Examiner admits some of Wojtczak's deficiencies (Office Action, p. 3), the application of Towery in combination with Wojtczak still does not cure Wojtczak's deficiencies in failing to teach or suggest each and every element of Applicants' claimed invention. Towery, while utilizing a bimodal particle approach (Office Action, p. 4), describes a polishing slurry for a low dielectric constant material, the particles contained in the polishing slurry and having a bimodal particle size being formed of an active metal oxide, such as ZnO₂, which differs from Applicants' claimed colloidal silica particles. See Towery, Abstract ("aqueous metal oxide sol slurry has been developed for removal of low dielectric constant materials"), col. 4, ll. 7 – 10 ("particles can be formed of a chemically active metal oxide material"), col. 6, ll. 48 – 59 (describing a "plurality of deposited conductive patterned metal features" that are "covered by a deposited dielectric material layer" wherein the dielectric material layer must be polished and planarized "before the next photolithography step"), and col. 14, ll. 46 – 49 ("metal oxide particles").

Even though Wojtczak does not teach or suggest all the features of Applicants' claimed invention, the Examiner's application of Towery does not render the recitations of Applicants'

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claims obvious. Towery, taken in combination with Wojtczak, still does not establish that there would have been the requisite suggestion or motivation in either reference to modify them to teach or suggest Applicants' claimed invention.

Moreover, while the Examiner alleged "it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the CMP process of Wojtczak et al. by substituting the two-step slurry approach of Wojtczak et al. with the bi-modal particle approach of Towery et al." (Office Action, p. 4). The Examiner then cited Towery's col. 14, ll. 15 – 21 to suggest simplification of the CMP process (Office Action, p. 4). This citation refers directly to Kubo, mentioned earlier in this Amendment. Kubo, while teaching a bi-modal particle size distribution (Towery, col. 14, l. 16), is directed to a lapping composition "which contains abrasive grains which are commercially available and which consists of plate alumina-powder prepared by milling" (Kubo, Abstract). Kubo's alumina powder is different from Applicants' claimed "colloidal silica particles," in part because Kubo's alumina powder particles are of micron-order size distribution. See Kubo, col. 4, ll. 20 – 25 ("powders respectively having average grain sizes of 4.5 μm , 2.8 μm , 9.6 μm , 11.8 μm , 14 μm and 40 μm "). This is clearly different from Applicants' claimed "particles hav[ing] a diameter ranging from 5 to 20 nm." This still does not teach or suggest the recitations of Applicants' invention not taught or suggested by Wojtczak or Towery. Since these references, taken alone or in combination, do not teach or suggest at least the above-mentioned elements of Applicants' independent claims 18 and 23, the Examiner's application of Wojtczak and Towery as references do not satisfy the tenants of a 35 U.S.C. § 103(a) rejection. The Examiner has therefore not met an essential criteria for establishing a *prima facie* case of obviousness, wherein "the prior art reference (or references

when combined) must teach or suggest all the claim limitations.” See M.P.E.P. §§ 2142, 2143, and 2143.03.

Furthermore, there is no suggestion or motivation to modify Wojtczak or Towery to produce Applicants’ claimed invention. Even the Examiner’s characterization of the references still does not establish that there would have been the requisite suggestion or motivation to modify them. “The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination.” M.P.E.P. § 2143.01, p. 2100-124, citing *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). As mentioned above, Wojtczak’s invention utilizes a two slurry approach to polish a metal, and Towery’s invention aims to polish the low dielectric constant material with a one-particle-size slurry. These two disclosures diverge both in their aim and in their method of slurry application. Because of this, their resultant combination cannot be obvious, since, for the reasons presented above, it does not produce Applicants’ claimed invention. Likewise, there cannot be any expectation of success from so doing, because combining the references still would not produce Applicants’ claimed invention. One skilled in the art would only arrive at the present claimed invention by consulting Applicants’ disclosure. Therefore, the only way to construct the claimed invention from the cited references would be to rely on aspects related to the present invention. Such reliance, however, would constitute improper hindsight reasoning. As Applicants have already established that the applied references cannot be modified to produce the present invention, Applicants submit that, according to the M.P.E.P., the Examiner’s citation of Wojtczak and Towery not sufficient to establish *prima facie* obviousness over Applicants’ independent claims 18 and 23. Similarly, without any motivation within Wojtczak or Towery to

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modify them, there can be no reasonable expectation of success from so doing to somehow produce Applicants' present invention.

Applicants have therefore demonstrated that the Examiner: (a) has not shown all recitations of Applicants' claimed invention are taught or suggested by Wojtczak or Towery; (b) has not shown any requisite motivation to modify Wojtczak or Towery to produce Applicants' claimed invention; and (c) has not shown there would be any reasonable expectation of success from modifying Wojtczak or Towery in order to produce the present claimed invention.

Regarding dependent claims 19 – 22, 24, and 25,

“Examiners are reminded that a dependent claim is directed to a combination including everything recited in the base claim and what is recited in the dependent claim. It is this combination that must be compared with the prior art, exactly as if it were present as one independent claim.” M.P.E.P.

§ 608.01(n)(III), p. 600-77. “If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.” M.P.E.P. § 2143.03, p. 2100-26.

Therefore, Applicants submit that independent claims 18 and 23 are allowable, for the reasons argued above. In addition, dependent claims 19 – 22, 24, and 25 are also allowable at least by virtue of their respective dependency from allowable base claims 18 or 23. Therefore, Applicants respectfully submit that the Examiner should withdraw the 35 U.S.C. § 103(a) rejection.

Regarding the new claims:

Finally, Applicants have introduced new claims 25 – 37 to provide coverage for other aspects of Applicants' invention. Applicants submit that new claims 25 – 37 are supported by the originally filed application, and therefore do not constitute new matter. Furthermore,

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Applicants submit that these new claims are allowable, at least by virtue of their respective dependency from allowable independent claim 18 or 23.

Conclusion:

In view of the foregoing, Applicants request the Examiner's reconsideration of the application and submit that the objections are overcome and that the rejection detailed above is improper and should be withdrawn. Applicants submit that independent claims 18 and 23 are in condition for allowance, as are dependent claims 19 – 22 and 24 – 37. A favorable action is requested.


Should the Examiner continue to dispute the patentability of the claims after consideration of this Amendment, Applicants invite the Examiner to contact Applicants' undersigned representative by telephone to discuss any remaining issues.

Please grant any extensions of time under 37 C.F.R. § 1.136 required in entering this response. If there are any fees due under 37 C.F.R. § 1.16 or 1.17, which are not enclosed, including any fees required for an extension of time under 37 C.F.R. § 1.136, please charge such fees to our deposit account 06-0916.

Respectfully submitted,

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Dated: February 10, 2003

By:  Reg 24,014
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APPENDIX TO AMENDMENT of February 10, 2003

"VERSION OF CLAIMS WITH MARKINGS TO SHOW CHANGES MADE"

AMENDMENTS TO THE CLAIMS:

Please amend claims 18, 22, and 23 as follows:

18. (Amended) A method of manufacturing a semiconductor device, which comprises:

forming a wiring groove on a surface of an insulating film formed above a semiconductor substrate;

depositing a conductive material film on a surface of said insulating film including an inner surface of said wiring groove; and

subjecting said conductive material film to a chemical mechanical polishing by making use of [either] a slurry for chemical mechanical polishing, which contains polishing particles comprising first colloidal silica particles whose primary particles have a diameter ranging from 5 to [30 nm, wherein the degree of association of the primary particles is 5 or less, or a slurry for chemical mechanical polishing, which contains polishing particles comprising first colloidal]20 nm, and second colloidal silica particles whose primary particles have a diameter [ranging from 5 to 20 nm, and second colloidal particles which are made of the same material as that of the first colloidal particles and whose primary particles have a diameter] larger than 20 nm, wherein the weight ratio of the first colloidal silica particles is in the range of 0.6 to 0.9 based on a total weight of said first and second colloidal silica particles to remove said conductive material film excluding a conductive material film portion which is buried in said wiring groove.

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22. (Amended) The method of manufacturing a semiconductor device according to claim 18, wherein said conductive material film is a laminate film composed of two or more layers comprising a conductive barrier film made of at least one kind of materials selected from the group consisting of TiN, Ti, Nb, W, WN, TaN, TaSiN, Ta, V, Mo, Zr and ZrN, and a wiring material film [and] laminated on said barrier film, said laminate film being subjected to said chemical mechanical polishing by making use of [the] said slurry for chemical mechanical polishing, which includes third particles formed of a material different from those of the first and second colloidal silica particles, to remove said conductive material film excluding a conductive material film portion which is buried in said wiring groove.

23. (Amended) A method of manufacturing a semiconductor device, which comprises:
forming a wiring groove on a surface of an insulating film formed above a semiconductor substrate;
depositing a conductive barrier film on a surface of said insulating film including an inner surface of said wiring groove;
depositing a wiring material film on said conductive barrier film to fill said wiring groove with said wiring material film;
subjecting said wiring material film to a chemical mechanical polishing to remove said wiring material film excluding a wiring material film portion which is buried in said wiring groove, said chemical mechanical polishing taking place, with the conductive barrier film on said insulating film being employed as a stopper, except for a conductive barrier film portion located inside said wiring groove; and

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subjecting a conductive barrier film portion which is located on said insulating film excluding said wiring groove to a chemical mechanical polishing by making use of [either] a slurry for chemical mechanical polishing, which contains polishing particles comprising first colloidal silica particles whose primary particles have a diameter ranging from 5 to [30 nm, wherein the degree of association of the primary particles is 5 or less, or a slurry for chemical mechanical polishing, which contains polishing particles comprising first colloidal]20 nm, and second colloidal silica particles whose primary particles have a diameter [ranging from 5 to 20 nm, and second colloidal particles which are made of the same material as that of the first colloidal particles and whose primary particles have a diameter] larger than 20 nm, wherein the weight ratio of the first colloidal silica particles is in the range of 0.6 to 0.9 based on a total weight of said first and second colloidal silica particles.

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Version of Abstract With Markings to Show Changes Made

A method of manufacturing a semiconductor device uses a slurry for chemical mechanical polishing during the manufacturing process, [which contains] the slurry containing polishing particles comprising colloidal particles whose primary particles have a diameter ranging from 5 to 30 nm, wherein the degree of association of the primary particles is 5 or less. This slurry for chemical mechanical polishing makes it possible to minimize [the] erosion and scratching [on the occasion when] whenever a conductive material film is subjected to a CMP treatment.

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